

11th June 2020

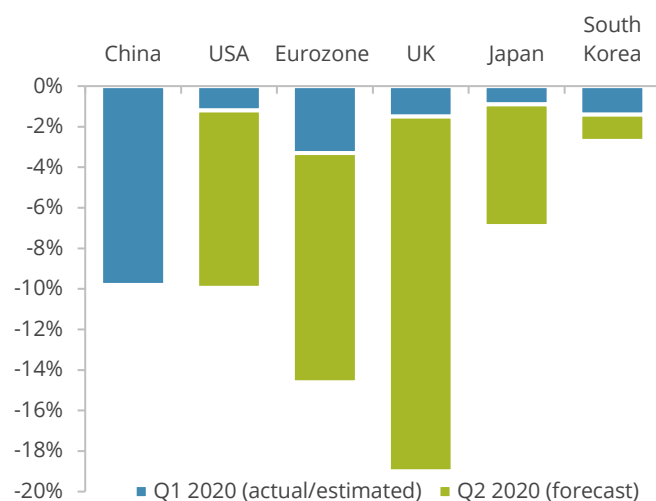
Impact of COVID-19 on the Mining Sector

The COVID-19 pandemic has had a devastating effect on many personal lives and on the global economy. The mining sector is far from immune to this disruption. But despite the economic dislocation underway, prices in several metals markets have actually gone up year-to-date and mining equities have outperformed many other sectors. This is in notable contrast to previous cycles, where mining equities and metals prices have tended to be more leveraged to downturns. This White Paper provides some cross-cutting perspectives on the reasons for this using a comparison of changes this year with those seen during the 2008-9 Global Financial Crisis. It then discusses some potential longer term implications of the current crisis for the metals and mining sector.

Introduction

The world economy has been experiencing its quickest and largest contraction in modern times. The International Labour Organisation (ILO) calculate that over 300 million people around the world have lost their job this year. Declines in GDP during the first half of this year are likely to be well over 10% in some major economies.

Figure 1: Cumulative Quarterly Falls in GDP (% q-o-q)



Source: Thomson Reuters, Roskill

The global battle with the virus is far from over but it is being better contained – at least in Europe, North America and large parts of Asia. Economic restrictions have already been significantly rolled-back in China and we are now seeing them being progressively eased elsewhere.

This leaves two important questions being asked by many mining firms and their customers at the current time:

- How is metals demand being affected by the downturn and what will be the speed and size of any “post lockdown” recovery?
- What might a “post-COVID-19” world look like compared to the one before the pandemic and what might be some of the medium and longer term effects on the mining sector?

To help answer these questions it is often useful to compare what is happening today to the experience in previous periods. In that regard, given the comparative scale of the economic dislocation currently underway, comparisons are inevitably being made to the experience of the world economy during the 2008-9 Global Financial Crisis (GFC).

This previous period was particularly traumatic for the global mining industry. The sector, as a whole, has performed much more robustly this time around. Nevertheless, Roskill think that metals markets will be challenged over the coming two quarters. A number of potential new forces are also in play, or being accelerated, as a result of the current crisis, which the mining sector will need to navigate in the years ahead.

Economic impact of COVID-19 compared to the Global Financial Crisis

Before making comparisons to the past, it is worth noting that whilst history often rhymes it is never exactly the same. Indeed, the current economic downturn has some unique characteristics compared to previous global recessions. Not least of these is that it is largely a result of a self-imposed “supply shock” rather than an unwinding of economic imbalances. In that sense, it is more resonant of oil price crises of the 1970s, periods of war or the effects on an economy of terrorist activity. The GFC is nevertheless still a useful reference point as it occurred on a similar global scale and in more modern times.

When considering the effects of COVID-19 on the mining sector it is important to recognise the very specific importance of Chinese supply and demand to metals markets. The GFC again provides a number of insights into how the crisis will affect the Chinese economy and how it might come out of the current downturn.

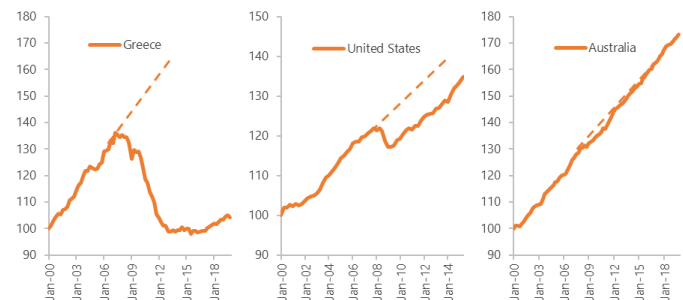
Comparison of recent economic trends outside China to the GFC

The GFC is often seen as a single event but it is important to recognise that there were major differences in how it was experienced by developed economies:

- Output in some of the main developed economies, including the US, declined by 2-5% and never returned to its pre-crisis trend after the GFC, although the rate of growth did eventually recover. This is usually characterised as a “U” shaped downturn.
- GDP in a small group of developed economies (e.g. Canada and Australia) stagnated or fell slightly but then returned relatively quickly to its previous trendline, characterised as a “V” shaped recession.

- In a final group of economies, most notably Greece and some other countries also impacted by the Eurozone crisis, not only did the economy come out of the period of the GFC with a lower level of output (falls of 5-10+%) but the trend in GDP afterwards was permanently lower. This gives an “L” shaped GDP profile.

Figure 2: Index of GDP for Greece, United States and Australia “L-U-V” (Q1 2000= 100)



Source: Thomson Reuters, Roskill

Which of these different patterns prevailed depended on success and efficacy of policy responses to the recession in each country and the extent to which economies had underlying structural issues going into the GFC, and which the crisis exposed. In the case of Greece, the country had been running excessive (and underreported) fiscal and current account deficits which reached the point where accumulated debts became unsustainable and the economy needed to “devalue” to a more sustainable level.

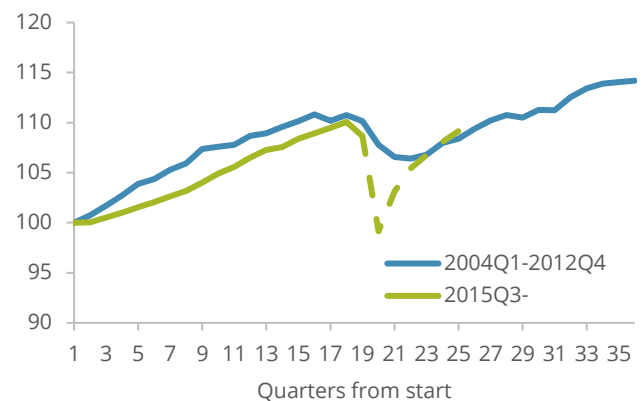
In the opposite case of Australia, its banks had very small exposures to the US housing market and to US banks. Subprime and other high-risk loans were only a small share of lending within the country. Although there was a significant initial shock to export demand, which then filtered through to investment, the government was able to offset this by undertaking an expansionary fiscal policy and the Reserve Bank lowered the cash rate, boosting

domestic demand. The economy also benefitted from its exposure to China, which pulled the Australian economy back up as it itself quickly came out of the downturn.

There is no clear evidence of there being the same degree of fundamental economic imbalances in the major developed economies ahead of the COVID-19 pandemic as there were going into the GFC. Underlying conditions therefore seem generally more supportive of a V shaped recovery in the world economy than they were in 2009. However, less positive outcomes for the strength of today's recovery are possible should the current crisis morph into causing macroeconomic breaks or behavioural changes. Examples of these could include a permanent fall in risk appetites and lower investment levels, temporary layoffs becoming permanent cuts to employment or a loss of productive capacity in the economy. Signals that these developments are taking place would include steepening interest rate risk curves, permanent falls in capital spending, structural unemployment (as opposed to temporary layoffs) and bankruptcies of previously viable businesses.

These are key risks at the current time, but there is no conclusive evidence that these are yet happening on a significant scale. Current consensus views for the United States economy see a recovery somewhere between a "U" and a "V" (see Figure 3), with two-thirds of the initial loss of GDP caused by COVID-19 being made up by end 2021. Although the initial shock to GDP would be significantly greater than that recorded during the GFC a much bigger proportion of this loss of output is therefore expected to be recovered.

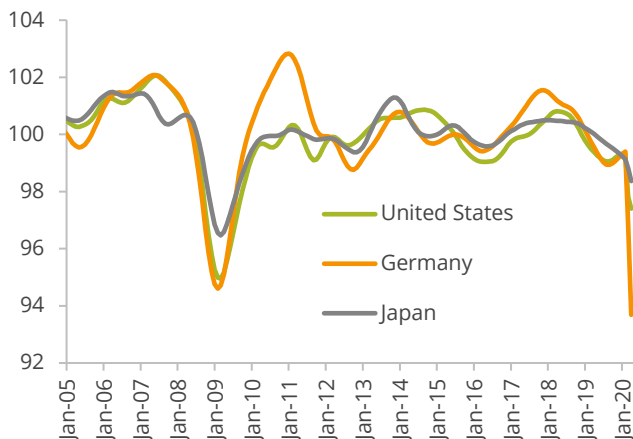
**Figure 3: Index of United States GDP
(Start quarter =100)**



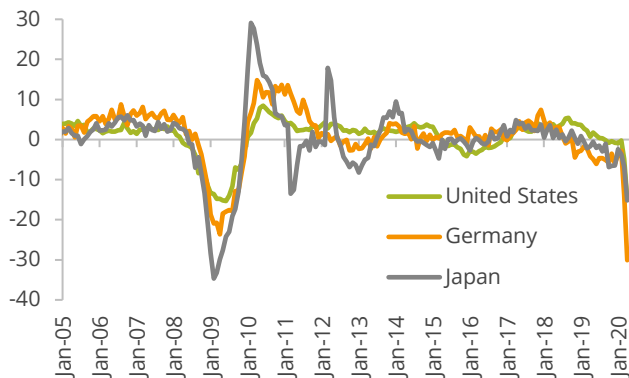
Source: Thomson Reuters, Roskill

Should downside factors become stronger and result in further downside risks to short-to-medium term growth outcomes, this would not necessarily be bad for longer term growth. A release of resources and the triggering of innovation in parts of the economy may improve longer run productivity. However, putting pressure in the other direction, the fallout of the current crisis is leading to a worsening in global relations. This may accelerate a trend towards deglobalisation and lead to a shortening in supply chains, more constrained flows of capital and reduced technological transfers. Such factors are likely to lower growth in global productivity and reduce economic convergence.

A difference between the COVID-19 crisis and the GFC worth noting in terms of its impact on the mining sector is that given the physical nature of the lockdowns and social distancing requirements, the former has had unusually severe impacts on the retail, hospitality and services sectors, which are not especially metals intensive consuming industries. Instead of focussing on GDP, Figure 4 and Figure 5 therefore compare trends in purchasing manager indices (PMI) and industrial production covering both the current period and the GFC for the three largest developed economies.

Figure 4: Purchasing Manager Indices

Source: Thomson Reuters, Roskill

Figure 5: Industrial Production (% y-o-y)

Source: Thomson Reuters, Roskill

What is firstly very striking from these charts is the relative speed of collapse in PMIs and industrial production recorded this year. The largest monthly decline in US industrial production during the GFC was a fall of 4% (in September 2008); one-third of the reduction reported in just April this year. One consequence of this is that inventories have not had time to go through their usual destocking pattern. Whatever metal inventories existed at the start of the COVID-19 crisis will largely remain in place. Should producers not believe demand will recover back to pre-COVID levels then destocking might hold back demand for metals for longer than in more usual economic cycles when restocking tends to magnify the recovery phase. So even if industrial production picks up the effect on metals demand may be more muted than in previous economic recovery phases.

Falls in industrial output during the GFC, though at a slower rate than this year, were over a prolonged period. The cumulative peak-to-trough decline during the GFC in the United States was a fall of 17% and output did not recover to its pre-GFC level until 2017. So far in the current downturn, the reported decline in United States industrial production (up to April this year) has been 16% compared to its prior peak.

For the EU, the peak-to-trough fall in industrial production during the GFC was 21% and nearly half of the loss of industrial output was never recovered. For Japan, the peak-to-trough fall in industrial production during the GFC was even more severe, a 35% fall. Again, nearly half of the loss of industrial output was never recovered.

Given that PMI indicators bottomed out in May we may already be close to a floor in industrial output and, if so, the falls this time are likely to be of a more comparable magnitude to the declines reported during the GFC than are the changes in GDP. As with the falls in GDP though, since industrial production has fallen much faster there has likely been less of a loss of industrial capacity than during the GFC and this suggests it can also recover much more quickly.

Comparison of recent economic trends in China to the GFC

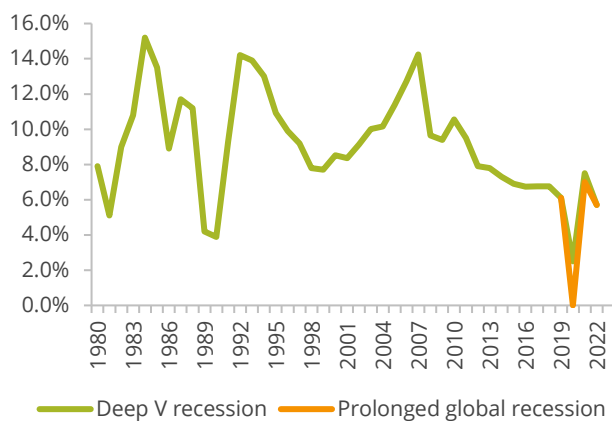
The other key difference in the world economy today compared to the period of the GFC that is important for metal markets, is that China is now a more developed economy which accounts for a much larger share of the world economy than it did a decade or so ago; 19% of global GDP on a purchasing power parity basis compared to 11% in 2007. Metals markets are now even more skewed towards China. The country accounts for over half of total world consumption for most metals, up from around one-third in 2007.

But whilst China represents a much larger share of the world economy than it did before its underlying rate of economic growth is significantly slower than it was a decade ago. Annual GDP growth in China in the three years prior to the GFC averaged 12.8% compared to 6.6% between 2017-9. The rate of

growth in Chinese industrial production has slowed even more between these two periods; from an average of 16.6% a year in the three years prior to 2008 to 6.1% a year.

The economic effects of the GFC in China were largely confined to 2-3 quarters and even during that period of time the economy continued to expand at a significantly positive rate. In fact, when spread over 12 months, the effects of the GFC in China are difficult to isolate compared to regular volatility in GDP.

Figure 6: Chinese GDP growth, 1980-2022 (%py)



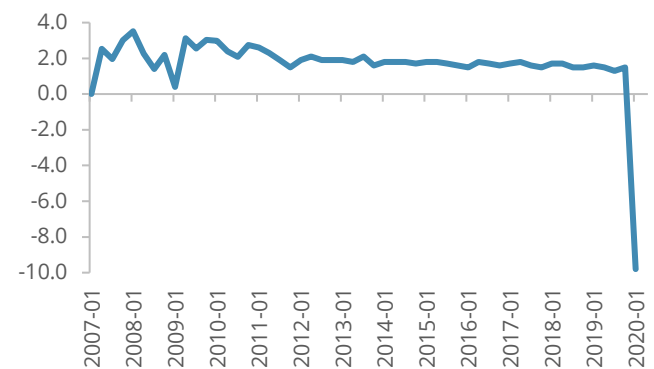
Source: Roskill

The effects of COVID-19 on the Chinese economy are likely to be much more notable given the extent of the contraction in GDP already reported in Q1 this year – a 9.8% q-o-q decline. PMI data for China has rebounded back even faster than in 2008 and 2009 though and industrial production and electricity output was already back into positive territory y-o-y in April.

This is not necessarily the “end game” for the effects of COVID-19 on China as some restrictions on the economy remain. A second wave of infections still represents a significant risk. Increasing international hostility could yet have unknown economic consequences. More fundamentally, a recovery in retail sales has yet to occur and, with weaker export demand likely, growth in China may be constrained by insufficient final demand. China’s abandonment of a GDP growth target perhaps an

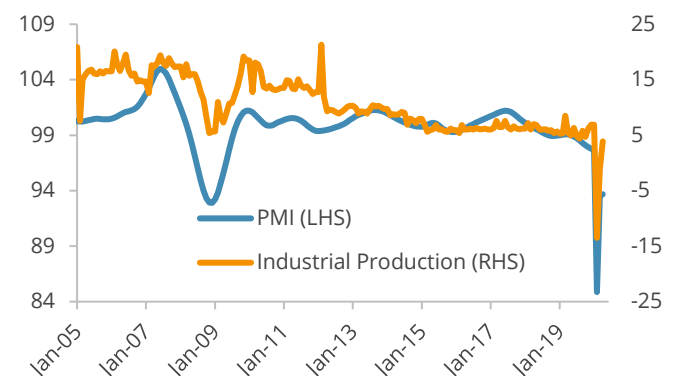
acknowledgement of some of these challenges the country faces. Nevertheless, the consensus view is for Chinese growth to be back up to 6% y-o-y by Q4 and it will record growth of around 2% over 2020 as a whole.

Figure 7: Quarterly Chinese GDP growth, 2007-2020 (% q-o-q)



Source: Thomson Reuters, Roskill

Figure 8: Chinese Industrial Production and PMI (% m-o-m and index)



Source: Thomson Reuters, Roskill

As with the recovery in China after the GFC this pick up in activity will need to be internally generated. In 2009 and 2010 an important driver for this was a major government stimulus package. Unlike its position before the GFC though, the Chinese government was running a sizeable fiscal deficit ahead of the COVID-19 pandemic and stimulus measures taken by the government have, so far have been limited. Actions enacted have been largely limited to capital injections or around 1.7 trillion yuan (approximately US\$240 billion) by the People’s Bank of China (PBOC), a reduction of the one-year lending facility rate of 0.10% and some loan financing to key industries. The efficacy of these will also be less than

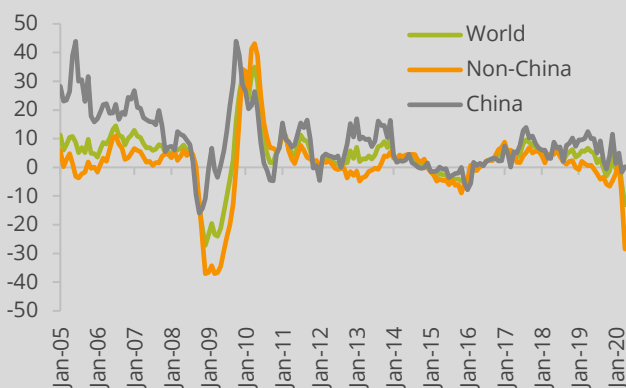
during the GFC as the economy is larger and there are less attractive projects in which to invest.

Exhibit 1: Steel production during the GFC

Crude steel production in April this year outside of China fell by 28.5% y-o-y. MySteel indicators suggest steel output in China in February and March may have fallen by around 15% y-o-y. In April production in the country as reported by the NBS was marginally up y-o-y. World crude production in April bisected these figures and was down 13% y-o-y.

These recent trends, although large, represent less extreme declines than those recorded during the peak of the GFC. Between its weekly peak and trough, steel output outside China fell by almost 40%. On a peak-to-trough monthly basis Chinese steel output fell 20%.

Figure 9: Crude Steel Production (% y-o-y)



Source: Thomson Reuters, Roskill

As with industrial production, steel production in developed economies never regained its previous levels after the GFC; with EU and US steel output remaining below 90% of its pre-crisis level and Japanese production remaining under 95% of its pre-crisis level. Chinese steel production was however back above its pre-crisis peak by February 2009. This drove global output to the same milestone a year later.

On the positive side, the Chinese economy is more mature than before – the economy is 2.2 times its size in 2007 – and whilst it has a slower rate of underlying growth this growth still has a fair degree of momentum behind it given its per capita GDP in

China is still only one-third that of the US. High levels of domestic savings allow for considerable scope for domestic consumption-led growth.

Effectiveness of policy responses

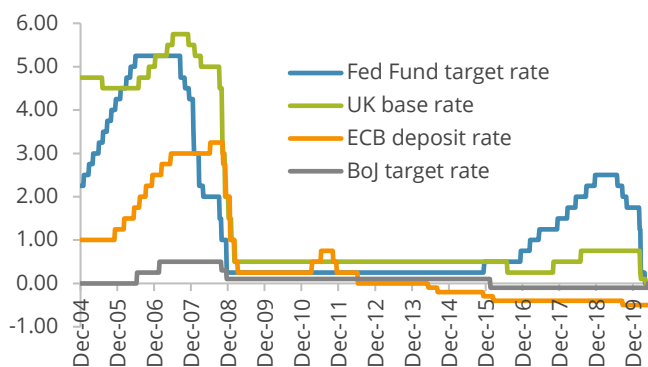
The “high-point” of the GFC was the bankruptcy of Lehman Brothers on 15th September 2008 but the crisis originated with the bursting of a housing bubble in the United States the previous summer and subsequent defaults on subprime debts, held largely by US and European banks and other financial institutions. The difficulties in the banking sector due to the GFC then exacerbated the Eurozone Crisis, which began in 2009.

Initial policy responses in the early phase of the GFC, in September 2007, followed orthodox textbook responses of reducing interest rates to boost demand and cut the cost of debt. What was different about the GFC from most prior post-war economic cycles – and why it became such a deep downturn – though was the extent of and uncertainty over bad debts in the banking sector. Growing fears of systemic or counterparty risk led to a drying up of liquidity in the financial system and resulted in restricted access to credit. Consumers and firms could not arrange sufficient borrowing necessary for usual economic activity to occur or to rollover debts. At the peak of the crisis difficulties in arranging trade finance meant that global trade started to seize up.

The crisis only began to ease after governments embarked on a set of special loans and restructuring packages in the banking sector. These saw a set of mergers and takeovers as well as insolvencies. Governments ended up holding or guaranteeing significant bank debt and taking direct equity interests in a range of financial institutions. This government lending, and additional borrowing to fund rising fiscal deficits as tax revenue collapsed was funded by an “unsterilised” expansion of central bank balance sheets. Although there were high levels of cooperation between the main central banks in developing and rolling out these measures, much of this was novel and highly controversial at the time. Policy responses, therefore, lagged the speed of the crisis.

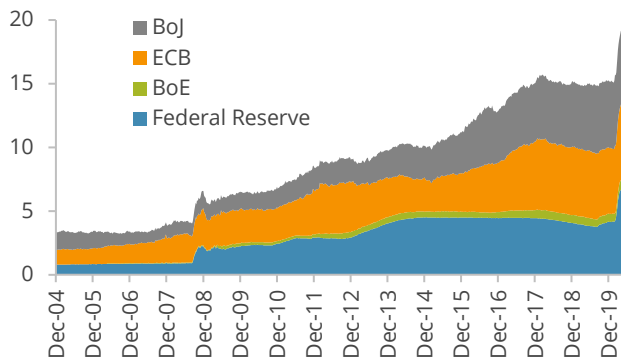
The effects on the real economy of the GFC were a combination of the consequences of rebasing the economy to a more sustainable level of economic activity magnified by the disruption of the crisis itself on consumption, investment and unemployment. OECD governments were left with fiscal deficits equivalent to 7.8% of GDP in 2009. Cuts in government spending in subsequent years, as they struggled to rebalance their accounts, then exacerbated a period of below par growth.

Figure 10: Main Policy Interest Rates (percent)



Source: Thomson Reuters, Roskill

Figure 11: Central Bank Balance Sheets (USD trillion)



Source: Thomson Reuters, Roskill

The effect of the GFC on the Chinese economy was largely felt through lower trade and inward investment. As previously referenced, the Chinese government's response to the crisis was to undertake a RMB4 trillion (around US\$600 billion) stimulus package during the course of 2009 and 2010, but announced in November 2008. This was equivalent to 14% of GDP at the time, a level relative the economy not dissimilar to fiscal packages announced

recently by the United States government to mitigate the effects of COVID-19.

The Chinese government also followed a very expansionary monetary policy, in the form of increased bank credits to state-owned enterprises (SOEs) and the private sector. This new money was made available quickly and a large part of it was directed towards infrastructure spending. In the event the Chinese economy was much less dependent on external demand than many had previously assumed and, again as already noted, the stimulus was highly effective in priming the Chinese economy. A significant part of the government stimulus ended up in non-performing loans in the Chinese banking sector in subsequent years.

As Figure 10 and Figure 11 also show, the monetary response to the current crisis has some similar characteristics to the 2008 and 2009 period – but has been much more timely. Whilst more positive for today, monetary policy is less important to solving the crisis this time as it causes are not monetary driven. The ability of government to cut interest rates to support the economy is, in any case, much more limited. Unlike ahead of the global GFC, interest rates were already low at the end 2019. Nevertheless, Central Banks have responded early and reduced policy rates to record lows. The Federal Reserve has cut the key Fed Funds rate from 1.75% to 0.5%. The ECB has edged down its deposit rate to -0.5% and the Bank of England has cut its base rate to 0.1%.

Alongside policy rate cuts, Central Banks have aggressively been expanding their balance sheets; to an even bigger and faster extent than during the GFC – a total of US\$4.5 trillion has been added to the balance sheets of the four main Central Banks so far this year. The purpose of this monetary expansion is different though this time. During the GFC, monetary expansion was designed to inject liquidity in the financial system. This time it is more directed towards funding sharp jumps in government borrowing caused by a loss of tax revenues whilst parts of the economy are locked down, finance loan guarantees to the corporate sector and spending on

income support, job retention programmes along with some limited tax cuts and rebates.

Unlike measures taken during the GFC, policy actions have been largely uncoordinated between countries. That has had only limited consequences for the main advanced economies, who are able to tap into global financial markets, but the IMF and World Bank have been largely side-lined and to date have only lent US\$80 billion to developing countries during the current crisis. That is well less than a 20% fall in remittances home by migrant workers that the World Bank expect this year. More promisingly in terms of regional collaboration, the European Commission has proposed a €750bn grants and loans recovery fund to help EU countries tackle an "unprecedented crisis", including issuing mutualised debt for the first time.

As previously remarked, notably absent to date has been any significant stimulus measures in China, although it is widely speculated that these remain an option should the recovery in the economy falter. This reluctance to act may partly reflect the experience of the GFC when the economy was seen to bounce back quite quickly and when much of the stimulus ended up being largely wasteful.

The other aspect of today that is different from 2008 and 2009 and of concern for the speed of recovery is the political context. Even before COVID-19 hit, the world economy seemed to be going through a phase of deglobalisation in both trade, finance, and technology. Ironically, this has largely been a result of a populist response to the austerity imposed in many economies after the Financial and Eurozone Crises. This change in popular sentiment does, however, mean that governments are less likely to cut spending after the COVID-19 pandemic fades to rebalance their fiscal position and, rather, live with higher levels of debt, raise taxes or do a combination of these.

Summary

Some key take-away points are:

- The current downturn is much sharper and more severe than that seen during the

GFC, reflecting an enforced "stop" to large parts of the economy. The GFC was a much more gradual, progressive, decline in activity.

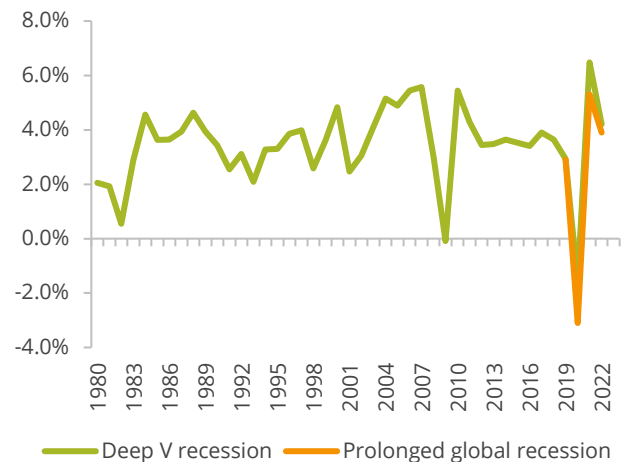
- We expect the decline in global GDP in this year to significantly exceed falls recorded during the GFC but the services sector is being more impacted relative to the manufacturing sector than it was during the GFC. The peak-to-trough falls in industrial production and steel output recorded so far are more comparable to the changes seen in the GFC.
- Industrial production in developed economies was slow to recover after the GFC and there was a permanent downwards shift in the level of industrial output. In the main developed economies around half of the fall in output was never recovered. Effects were not uniform though, and the recovery in countries without underlying structural issues was more "V shaped" with their economies returning close to previous trends by 2010. This, importantly, included the Chinese economy.
- The initial hit from COVID-19 has been larger, more sudden and more global than the GFC. There are some good grounds though for thinking that the recovery will be equally sharper and with less persistent negative effects on metals demand:
 - Although the economic recovery depends on controlling the spread of COVID-19 and some "hysteresis" effects are likely there is less evidence of prior underlying economic imbalances that will prevent a "V" shaped recovery.
 - Economic policy responses have been less globally coordinated but they have benefitted from previous lessons learnt and have been much faster than those taken during the GFC.

- There appears to be less appetite for governments inflicting a period of austerity after the COVID-19 pandemic is over.
- Mining is even more leveraged to a still resilient Chinese economy, which has already bounced back strongly from the effects of COVID-19. The durability of growth in Chinese domestic demand has usually been underestimated and the government will be able to carry out further stimulus measures if growth subsides.
- There are, however, some potential new downsides to recovery and future growth from the current crisis, driven by worsening in international relations and potential changes to supply chains. The longer the pandemic continues the more likely it is that it will have more permanent effects on industrial output.

External party forecasts for global GDP are uniformly bleak and range up to a 6% decline in world GDP this year, with output in the worst affected developed economies falling by as much 15% in some scenarios. The worse expectations need to be moderated by the points above though and the latest consensus view is that the world economy will contract by around 2%

this year – somewhere between Roskill’s “Deep V” and “Prolonged Recession” set of assumptions.

Figure 12: World GDP growth, 1980-2022 (%py)



Source: Roskill

Notes: Weighted based on purchasing power parity (PPP)

This would still be the biggest annual decline excluding a major global conflict since the 1930s. Under both scenarios the world economy is likely to bounce back strongly in 2021 but with a prolonged recession global economic output would be permanently scarred. As noted above, given the relative resilience of the Chinese economy and the broader nature of the downturn metals demand is likely to relatively outperform trends in GDP compared to its relationship in previous cycles.

Metals prices and mining equity trends

Prices of metals and other commodities are commonly subject to large cyclical fluctuations. That reflects a combination of supply and demand factors:

- A preponderance of demand in manufacturing goods and the auto and construction sector which are highly geared to changes in income. This is exacerbated by stocking and destocking patterns along the production value chain of these goods. Econometric analysis by Roskill suggest that the short run elasticity of demand to changes in the rate of global GDP growth is a factor of 3-5 for most metals. This factor is higher for technical metals like tungsten, tantalum and molybdenum than it is for steel and copper, which have a wider range of end uses.
- Supply of metals raw materials (or at least production capacity) is determined by levels of investment made several years previously. High levels of fixed or “sunk” capital and operating costs as a proportion of total costs mean that production is “sticky” or slow to respond to price signals.

- Metals markets are, in the main, highly competitive where the cost of the “marginal tonne” sets prices across the whole of the market and where investors actively trade. Any change in supply and demand balances, therefore, quickly feeds through into price.

Table 1 shows the max-to-min change in monthly average copper prices during the last four economic cycles and the current cycle. Typical declines in price in previous cycles were around 50% and up to 65% during the GFC. Despite the severity of the economic impact of COVID-19 the maximum decline in the current cycle from its most recent peak so far is less than 29%. The latest spot price for copper is only 20% below its previous cyclical high.

Table 1: Changes in Min-Max Monthly Average Copper Price (\$/tonne)

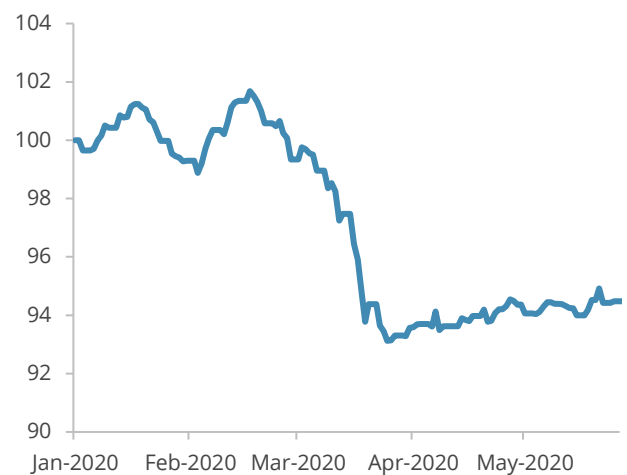
Period	Max	Min	Change
1989-1993	3,390	1,632	-52%
1997-2001	2,604	1,377	-47%
2007-2009	8,714	3,079	-65%
2011-2015	9,881	4,643	-53%
2019-today	7,072	5,052	-29%

Source: LME, Roskill

This historical pattern for copper is repeated across other metal markets. Figure 13 shows the daily performance of an unweighted price index for a number of metals covered by Roskill. The year-to-date change in this index shows a much smaller

decline than might be expected given the degree of economic disruption underway – the fall in the index since the start of January to today is around 6%. Most of that decline occurred in the second half of March, a period when COVID-19 began to appear with increasingly frequency outside China and the number of economies going into “lockdown” began to increase significantly. Since the start of April though, when restrictions began to be eased in China, the index has been trending gradually back upwards.

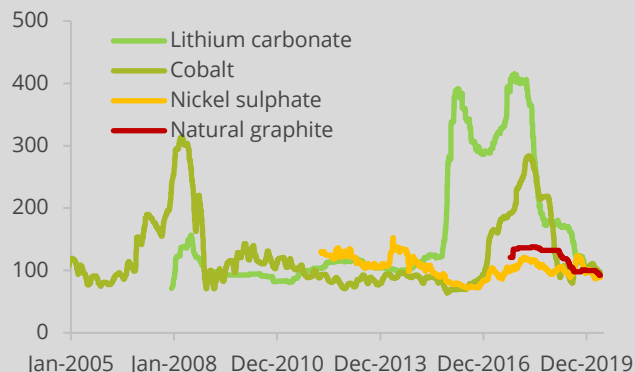
Figure 13: Index of Minor Metals Prices (Index 1/1/2020=100)



Source: Roskill

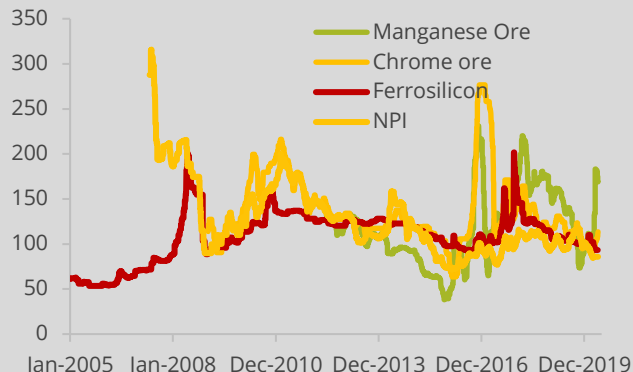
Note: Unweighted index of daily changes in lithium carbonate, cobalt, nickel sulphate, graphite, Pr oxide, copper, titanium metal, AP, tin, tantalum. Ferromanganese, ferrosilicon, NPI, chrome ore, niobium, vanadium pentoxide and ferromoly.

Figure 16: Battery Raw Materials Prices (Index 1/1/2020=100)



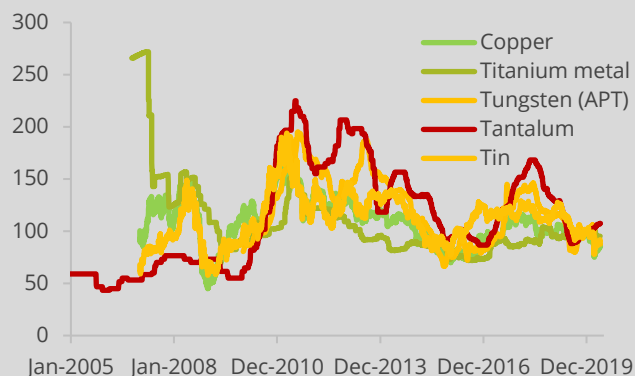
Source: Roskill

Figure 14: Steel Bulk Alloys Prices (Index 1/1/2020=100)



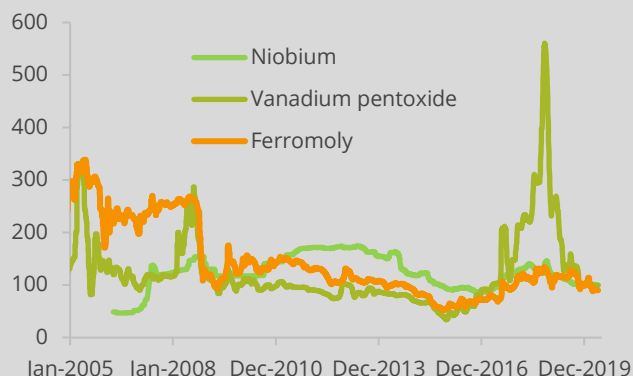
Source: Roskill

Figure 17: Technical Metals Prices (Index 1/1/2020=100)



Source: Roskill

Figure 15: Other Steel Alloys Metals Prices (Index 1/1/2020=100)



Source: Roskill

Figure 18 provides a longer term perspective on current price levels. What is notable about this is that even before COVID-19 appeared the index had fallen significantly from its prior peak. On average, prices across the metals included in the price index had already fallen by 17% in 2019. In comparison, before the GFC hit the price index was at a cyclical high. But whilst metals markets had less scope to fall before COVID-19 hit the index today is still around 25% above its cyclical lows recorded in 2009 and end 2015 and it remains close to its long term trend level.

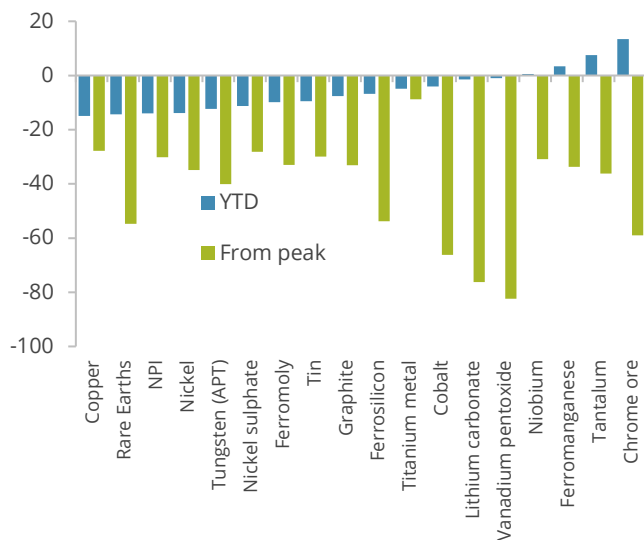
Figure 18: Index of Minor Metals Prices (Index 1/1/2005=100)



Source: Roskill

Within this aggregate index there is some variation in the relative performance of individual metals prices. On one side, the price of niobium, manganese, chrome, and tantalum have actually risen for the year-to-date. In contrast, the price of more exchange driven metals, including copper and nickel products have declined the most.

Figure 19: Change in Selected Metals Prices (Percent)

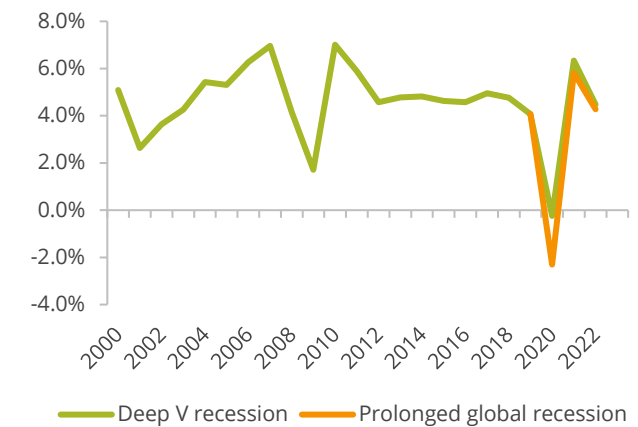


Source: Roskill

The current cycle is far from over and Roskill's commodity outlooks generally suggest a period of two quarters of softer market conditions whilst weak demand is likely, but the relative resilience of metals prices compared to previous cycles is notable. This reflects a number of factors that are different about this cycle compared to previous ones:

- Metals demand is likely to outperform global GDP for reasons already discussed, including the resilience demonstrated by the Chinese economy along with China's increased share of global metals consumption. Figure 20 shows the trend in global GDP growth when weighted by copper consumption.

Figure 20: Global GDP growth weighted by copper consumption (%py)

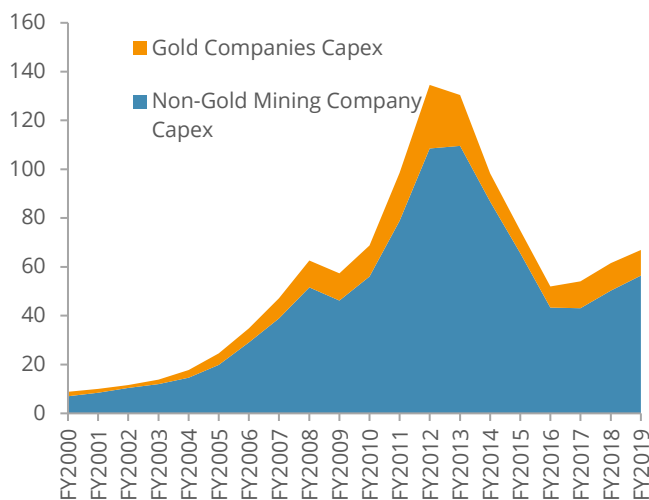


Source: Roskill

- Destocking was taking place in the second half of 2019 and prices at end-2019 were already significantly below peak levels for several metals. In particular, steel bulk alloys prices were already being set by cost floors prior to the COVID-19 pandemic.
- COVID-19 has had direct offsetting effects on supply. Bulk ferroalloy exports from South Africa (e.g. chrome and manganese) were halted between late March to the start of May when major port and rail capacity was closed. Tantalum producers in Central Africa had to seek alternative routes to market through Tanzania and elsewhere. Many of these cuts in supply have been widely reported. Less well publicised have been cuts in raw materials supply in China due to restrictions in movement in the country. Nickel sulphate output in the country, for example, was down by 40% in Q1.
- Over and above enforced mine closures due to COVID-19, producers have been proactive in managing supply in some markets. For example, Glencore idled its Mutanda cobalt mine in the DRC in November 2019. In niobium, despite only recently undertaking significant capacity expansion CBMM has adjusted mine supply to maintain stability in the market.

- Whilst there are some markets, notably lithium, that have been a focus for investment in the last few years the mining industry as a whole has been reluctant to commit to new projects. Investment by the mining sector in 2019 was only half its 2012 peak. Whilst in absolute terms capital spending by the mining sector in 2019 was similar to that just ahead of the GFC the sector is much larger and investment was much lower as a share of revenue; it has averaged 10% of annual revenues over the previous three years compared to 16% in 2007.

Figure 21: Mining Sector Capex (US\$ billion)



Source: Thomson Reuters, Roskill.

Note: Based on survey of 65 major mining companies

- In the case of EV materials, the effect of COVID-19 has been to take some of the excess out of the market but Roskill's medium to longer term view for rapid expansion of the EV sector has not fundamentally changed and extended supply chains between mines, mineral processors, battery manufacturers and auto manufacturers are acting to smooth fluctuations in sales of EVs on demand for raw materials.

The flip side of the recent resilience of metals prices downwards, however, is likely to be less upside in the recovery phase.

Mining equities

During the GFC, mining indices plunged 60-70%. The sector has been far less impacted this time around. In fact, after falling 30-40% between the start of 2020 and late March this year mining indices have shown a sharp recovery. The ASX 300 Australian Mining index is within a whisker of its start-year level. Part of this resilience reflects the inclusion of a number of gold producers in the index, but recent increases in mining equity prices have been widespread. For example, the share price of the fourth largest iron ore producer – Fortescue Mining Group – has risen to a historic high. The share prices of the two largest mining companies, Rio Tinto and BHP, are within touching distance of their start year levels whilst the broader FTSE index is still down 16% year-to-date.

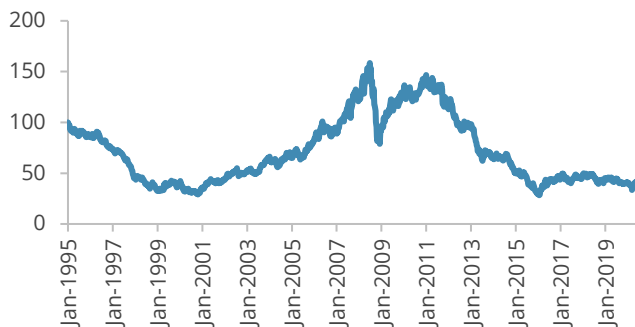
Figure 22: Mining Sector Equity Indices (Index, 1/1/2005 = 100)



Source: Thomson Reuters, Roskill

Mining valuations have historically tended to be more geared to changes in global economic activity and more volatile than the rest of the market. However, as well as holding up much better in absolute terms, they are holding up more strongly against the broader equity market this time around.

Figure 23: MSCI Mining Sector Index Relative to MSCI Global Index (Index, 1/1/1995 = 100)



Source: Thomson Reuters, Roskill

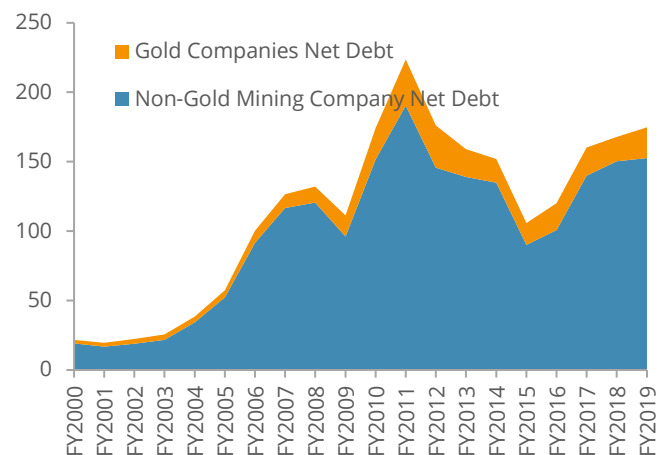
The main factor driving mining stocks is of course changes in metals prices and as previously outlined and these have been less affected than in previous downturns. A number of other factors are also supporting the share price of mining companies:

- Lower fuel input prices, exchange rate movements and cuts in interest rates are providing a major offset to lower metals prices.
- In contrast to many firms in the oil and gas sector, banking, retail and other industries, mining companies have mostly signalled they will maintain dividend payments.
- Going into the downturn metals prices and industry multiples were already at relatively

modest levels, especially in comparison to broader indices.

- The industry was less leveraged going into the downturn compared to previous cycles. Non-gold mining companies had a net debt/EBITDA ratio of 1.4 in 2019, half the ratio to that in 2015.
- Mining is being used by a number of investors as a “play” on the Chinese economy or to hedge against the possibility of the COVID-19 pandemic being more quickly resolved.

Figure 24: Mining Sector Net Debt (US\$ billion)



Source: Thomson Reuters, Roskill.

Note: Based on survey of 65 major mining companies

Impacts of the GFC and COVID-19 on the mining sector

The GFC had a highly disruptive effect on the mining industry. That was somewhat inevitable given the size of the falls in prices. The effects of this were, though, magnified by a rising cost base, large capital commitments and debt ratios and the lack of liquidity in the banking sector. This led to unusually widespread risk of insolvency in the sector, even for low cost miners who had weathered previous downturns.

This vulnerability was ironically exacerbated as the industry had been slow to recognise and act on the effect of China’s emerging economy on demand for metals in the early 2000’s. Mining companies had spent the next five years up to 2008 investing to try to catch up. Industry debt levels had risen five-fold (see Figure 24) as investment in new supply picked up and as firms had spent windfalls to acquire new assets. The period saw a major restructuring of the mining landscape. Major multi-billion transactions

prior to the GFC included BHP's acquisition of Billiton in 2001 and of WMC in 2005, Vale's purchase of Inco in 2006, Freeport buying Phelps Dodge in 2007, the formation of Xstrata (though the combination of Noranda, Falconbridge and MIM) between 2003-6 and Rio Tinto's purchase of Alcan (itself already recently merged with Pechiney and Alusuisse) completed in early 2008.

When the GFC hit, all of these firms were caught out, but Rio Tinto was especially vulnerable due to the size of its acquisition (US\$38.1 billion), its later timing and as a divestment programme to carve out unwanted downstream assets had yet to complete.

Response of the mining industry to the GFC

Short term actions by mining companies to manage the situation during the GFC included:

- Cuts to employee numbers and halting of "non-core" operating activities, often including exploration spending
- Postponing or cancelling growth and capital projects, some of which were already in execution
- Reductions in output in line with demand
- Rights issues or raising of new equity
- "Firesale" disposal of assets

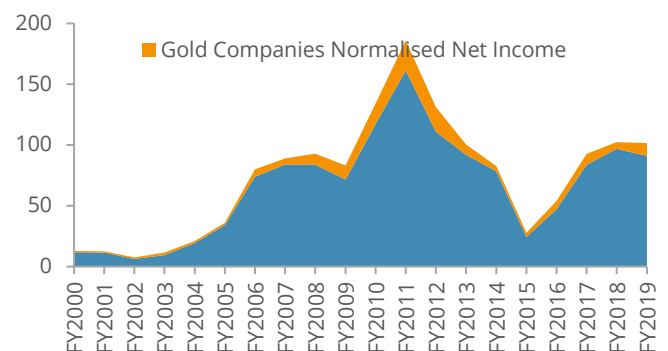
Major mining company CEOs have emphasised that measures taken were prioritised according to longer run strategic objectives. For example, only non-core assets were sold, and firms continued funding some investments and business improvement projects rather than just basing all decisions on simple cash considerations. A focus on maintaining safety levels rather than just cutting costs was highlighted by most firms at the time.

The implementation of these measures was, though, somewhat haphazard with firms responding to events and mistakes inevitably being made along the way. Adjustments to supply were often slow to be implemented and many of the actions taken turned out to be value destructive. Halting then later restarting projects significantly added to future costs and complexity and contributed in major cost

overruns. Assets were sold off too cheaply. Employees who were laid off had to later be re-hired.

Whilst extreme at the time, the effects of the GFC on the mining sector turned out to be relatively short-lived as a resumption of growth in Chinese metals demand resulted in a quick recovery in prices. Industry profitability rebounded in late 2009 and hit a peak in 2011. Rather than take time to consider the nearly catastrophic effects on the sector of its overexposure to price volatility the industry focus shifted quickly back into an expansionary mode.

Figure 25: Mining Sector Adjusted Net Income (US\$ billion)



Source: Thomson Reuters, Roskill.

Note: Based on survey of 65 major mining companies

The surge of investment that followed as projects put on-hold during the GFC were resumed and new investments were initiated (see Figure 21) along with gradual slowing in growth in demand led to progressive deflation in metals prices during 2013-15. This period, marked by a persistent decline in industry profits, could be considered to be a delayed hangover from some of the fundamental issues briefly exposed during the GFC, in particular low returns on investments and risky balance sheets. Companies with a history of poor project returns and unaffordable or excessive capital commitments were again punished by the markets.

This period culminated in a number management changes and a major shift in the strategy across the mining sector. A shift to distributing a larger share of profits to shareholders and less to investment took place. More stringent capital allocation and investment hurdles were widely introduced.

Improved systems for planning and stress testing portfolios were introduced. To improve capacity to manage volatility debt targets were reduced and policies introduced to make dividend payments more flexible. Though actions are not necessarily widespread, mining companies like Glencore have been more proactive in managing supply to limit the accumulation of large stocks of metals in a downturn.

That metals prices and the mining industry has been more resilient to COVID-19 than during the GFC in part reflects some of these previous lessons learnt and the changes implemented by the mining industry. That said, the process has not been painless and some short term adjustments have still taken place. According to data compiled by Reuters, the fallout of the coronavirus outbreak has forced global miners to cut their 2020 capital expenditure by about \$6.4 billion, (almost 19%) and copper production outlook by 8% or just under 400,000 tonnes for the year. Roskill calculate that changes in supply of some other metals have been even larger; forecasts for lithium supply this year have been cut by 30%.

Longer run effects of COVID-19 on the mining industry

The COVID-19 pandemic has highlighted a number of vulnerabilities in the world economy and is likely to cause or accelerate a range of macroeconomic and microeconomic changes. At the macro level, the rate of growth in different economies, levels of debt, inflation and interest rates have changed. At a micro level, a shift to “working from home” during the crisis may never fully reverse with implications for the design and use of urban areas and the layout of office space as well as demand for transportation. The uptake of online and remote services, including retail, healthcare and education may have fundamentally been accelerated.

The current crisis therefore raises multiple questions for mining companies and consumers of metals about their previous assumptions over the outlook for metals markets and the robustness of their production or procurement and other strategies. Amongst these, Roskill would highlight:

- **Reinforcement of conservative investment strategies and balance sheet management.** An overarching lesson from the past about commodity markets is that they are highly mean reverting, and that rather than extrapolating short term trends it is usually advisable “to be an optimist when prices are low and a pessimist when prices are high”. Whilst getting into a situation where balance sheet constraints drive operating and investment decisions is probably inevitable in the mining sector at points in the cycle given the capital intensity of building new supply, being able to minimise these and profit from turning points has, time and again, been shown to be an important driver of achieving above average long run industry returns. Enablers of this for producers include:
 - Continuous focus on cost management and maintaining or improving the position of assets on the cost curve through the cycle.
 - Improving access to funding though more cautious debt management and planning, more flexible distributions of cash flows and ensuring a robust return on investments.
 - Maintaining a focus on long term strategic objectives whilst developing organisational agility and flexibility to respond to short term crises.
- **Impacts on demand trends.** Demand for metals is being impacted in the short term by disruptions to the economy and effects on employment and incomes. Under the “Prolonged Recession” case, global GDP would be permanently below its pre-COVID-19 trend so some of this would persist. The pattern of future use of metals will also be affected by microeconomic changes, which may change the pattern of use for metals in sectors such as transportation. For example, should aerospace not fully recover, as outlined in a previous Roskill White Paper, there will be a permanent downwards shift in titanium metal and rhenium demand. In the

short term producers should adjust their supply accordingly. Longer term though, demand for most metals is expected to continue to rise.

- **EV's and the green economy.** Roskill does not think that the trend towards electrification and growth in electric vehicles (EVs) has fundamentally changed as a result of COVID-19. In the short to medium term, lower oil prices and a loss of profits by the auto sector to fund the development of EVs may delay the process, especially as governments are likely to pause environmental regulations and focus on preserving current jobs in the near term. However, the crisis has eased concerns over raw materials supply constraints and lowered EV raw material prices, which will improve the economics of manufacturing electric vehicles compared to ICE vehicles. There also seems to be an increased willingness by governments to take on more long term debt to invest as a result of the crisis and this is likely to be directed towards a "green agenda". Although recent events make it less likely that there will be globally coordinated cuts in emissions, the last weeks have highlighted to many people the effects of pollution on the environment. These factors reinforce Roskill's expectation of a positive outlook for EV raw materials demand over the longer run.
- **Lower energy prices.** Oil and gas prices have been hard hit by the COVID-19 crisis due to the combination of its effect on demand (which is especially focussed on transportation) and as international collaboration on managing the supply of oil has fragmented. These factors are related inasmuch as lower prices caused by the first have been a trigger for the second effect. Roskill's assumption is that the price of oil will gradually move back up as supply adjustments take place, but the structural price of oil may have permanently moved down – particularly if the previous points on

the development of the "green economy" prove to be correct. This will have negative effects on longer run demand outlook for some metals that are especially dependent on use in the oil and gas sector, such as molybdenum and fracking sands and PGM catalysts. Lower energy prices also have implications for mining cost curves. They will move downwards, with the benefits felt disproportionately by more energy intensive, usually lower grade, operations.

- **Supply chains and deglobalisation.** The COVID-19 pandemic has accentuated tensions between countries and magnified what were already growing concerns over the vulnerability of the supply chains of many goods and services to disruptions. There are inevitable trade-offs between trying to minimise costs and relying on extended supply chains, but these pressures are driving trade towards a more federated and less global structure. In addition, we are seeing a trend towards increased traceability and ESG requirements being imposed by customers of mining products. The London Metals Exchange is looking to introduce a specific contract for low carbon aluminium. For commodity producers this is likely to lead to more use of preferred access or partnership arrangements and an increased willingness by customers to pay a premium for more reliable suppliers. Upstream and downstream integration is also more likely. Volkswagen, for example, is reportedly close to investing in a Chinese battery maker. Separately, governments and government agencies – including the US Department of Defense and the European Commission – are increasingly looking at how they can support the development and supply of critical raw materials such as rare earths.
- **Operational resilience.** As a consequence of increased supply chain risks firms may decide they need to build more redundancy into their operating assets. For mining assets that may involve higher levels of inventories

and spares, a greater use of automation, procurement through a wider range of suppliers, increased biosecurity controls and increased ownership or direct control of logistics networks. This will inevitably have consequences for costs and prices.

- **Lower interest rates and industry cost of capital.** Survey data suggest that mining companies are investing on the basis of a real industry cost of capital of around 8%, and often apply hurdle rates well above this level. This assumes a historical real rate of interest of around 2% and an industry “beta” that is well above other parts of the economy. Both of these assumptions may no longer hold given; US long 10 year government bond yields are negative and since 2015 the mining index has followed global equities. The valuation of mining assets is highly geared to its cost of capital and lowering the rate of

return would significantly increase the value of mining assets.

- **Taxation and political risk.** A counterweight to a lower cost of capital may be higher taxation of the mining sector as governments look to raise revenues to close fiscal deficits and repay debts incurred as a result of COVID-19. Mining assets often prove to be a tempting target for such taxes due to their fixed geographical nature. At the extreme this can result in the full nationalisation of assets. Heightened risk of this, and also the supply chain risks already discussed, mean that country risk premia may increase in some jurisdictions. More investment in the mining sector as a result may move back to more perceived stable countries. This may benefit, for example, the development of nickel and lithium projects in Australia over other investments.

Conclusions

To conclude, the effects of the COVID-19 crisis are leading to a multi-decade record contraction in global GDP. Industrial production is also being severely impacted, but it is likely to hold up better relative to GDP than in previous downturns. Changes are, so far, more comparable in scale to the GFC.

Whilst scales of change are similar, the speed of collapse in industrial output has been much faster compared to the GFC. An upside to that for metals demand in the short term has been an absence of destocking effects magnifying the changes in industrial production, as usually happens. As a counterparty to the faster decline in GDP and industrial production, Roskill expects the recovery to be much sharper. In addition, whilst there is general pessimism about the economic outlook, Roskill are still optimistic that demand for most metals will eventually recover back to pre-COVID levels. That recovery will likely be quicker for steel raw materials, demand for which is more China-centric. Demand for some metals, like tantalum and rhenium, which

are dependent on particular end uses such as aerospace will take longer to recover.

Compared to its state at the start of the GFC, the mining sector is structurally much better positioned to weather the current crisis and the resilience of metals prices and mining equities to the downturn has, so far, been remarkable. Roskill's index of metals prices remains 25% above its previous cyclical lows and it is only modestly down for the year-to-date. This resilience partly reflects falls in price that had already taken place in 2019 and as supply adjustments in several markets have offset the effects of lower demand. There may, though, be some general price weakness in the next two quarters as supply disruptions caused by COVID-19 are resolved and as some later inventory destocking is possible.

Roskill's views on the fundamentals of the metals markets it covers have not fundamentally changed as a result of the COVID-19 pandemic. In the short term, the crisis may delay the development of the EV sector

and demand for battery raw materials, but the crisis may be a trigger stronger growth in demand for these products over the medium to longer run. The current crisis has, though, exposed the vulnerability of some supply chains and accelerated risks of deglobalisation. For the mining sector this highlights the need to improve operational resilience. In addition, for some time, we have been seeing a trend towards increased traceability of goods and growing

ESG requirements by purchasers of metals. COVID-19 may accelerate these trends. For commodity producers this is likely to lead to more preferred access or partnership arrangements. This, along with changes in the cost of capital, energy input prices and political risk, may push up industry margins and shift the location of growth in metals supply back more towards developed regions.

Table 2: GDP growth, 2019-2021 (% y-o-y)

	Deep V			Prolonged Global Recession		
	2019	2020	2021	2019	2020	2021
World⁽¹⁾	2.9%	-1.6%	6.5%	2.9%	-3.1%	5.3%
Western Europe	1.6%	-5.0%	5.7%	1.6%	-7.0%	4.6%
Eastern Europe	1.9%	-3.6%	6.5%	1.9%	-4.7%	4.2%
NAFTA	2.3%	-4.2%	5.5%	2.3%	-5.0%	4.5%
Central America	0.7%	-3.2%	5.3%	0.7%	-5.6%	3.3%
South America	1.0%	-2.8%	5.5%	1.0%	-4.8%	3.6%
China	6.1%	2.5%	7.5%	6.1%	0.0%	7.0%
India	4.2%	2.0%	10.4%	4.2%	1.0%	8.4%
Japan, Korea and Taiwan	1.3%	-2.3%	3.3%	1.3%	-2.7%	2.6%
Other Asia	4.4%	0.0%	7.6%	4.4%	-0.9%	7.0%
Oceania	1.9%	-3.9%	6.3%	1.9%	-5.0%	6.1%
Middle East	-1.5%	-3.1%	5.1%	-1.5%	-3.9%	3.3%
North Africa	3.8%	0.7%	6.5%	3.8%	-0.9%	3.9%
Sub-Saharan Africa	2.8%	-0.1%	5.7%	2.8%	-1.7%	3.8%
Argentina	-2.2%	-5.0%	3.7%	-2.2%	-5.7%	4.4%
Australia	1.8%	-4.0%	6.3%	1.8%	-5.0%	6.1%
Belgium	1.6%	-4.6%	5.3%	1.6%	-7.0%	4.5%
Brazil	1.1%	-3.0%	5.4%	1.1%	-5.3%	2.9%
Canada	1.6%	-4.5%	5.5%	1.6%	-5.3%	4.0%
China	6.1%	2.5%	7.5%	6.1%	0.0%	7.0%
Egypt	5.6%	2.1%	8.2%	5.6%	2.0%	2.8%
France	1.3%	-5.0%	5.1%	1.3%	-7.2%	4.5%
Germany	0.6%	-5.0%	5.2%	0.6%	-7.0%	5.2%
India	6.1%	4.2%	2.0%	6.1%	4.2%	1.0%
Iran	-7.6%	-5.0%	4.0%	-7.6%	-6.0%	3.1%
Italy	0.3%	-7.0%	5.3%	0.3%	-9.1%	4.8%
Japan	0.7%	-3.3%	2.7%	0.7%	-3.0%	2.0%
Malaysia	4.3%	-0.6%	7.9%	4.3%	-1.7%	9.0%
Mexico	-0.1%	-3.7%	4.9%	-0.1%	-6.6%	3.0%
Netherlands	1.8%	-4.6%	5.3%	1.8%	-7.5%	3.0%
Nigeria	2.2%	-2.5%	5.5%	2.2%	-3.4%	2.4%
Pakistan	3.3%	-1.4%	5.3%	3.3%	-1.5%	2.0%
Philippines	5.9%	2.4%	8.6%	5.9%	0.6%	7.6%
Poland	4.1%	-3.2%	6.4%	4.1%	-4.6%	4.2%
Russia	1.3%	-4.4%	5.8%	1.3%	-5.5%	3.5%
Saudi Arabia	0.3%	-2.8%	5.2%	0.3%	-2.3%	2.9%
South Africa	0.2%	-3.9%	4.4%	0.2%	-5.8%	4.0%
South Korea	2.0%	-0.3%	4.2%	2.0%	-1.2%	3.4%
Spain	2.0%	-6.9%	7.0%	2.0%	-8.0%	4.3%
Taiwan	2.7%	-1.8%	4.3%	2.7%	-4.0%	3.5%
Thailand	2.4%	-0.7%	5.7%	2.4%	-6.7%	6.1%
Turkey	0.9%	-3.3%	6.7%	0.9%	-5.0%	5.0%
United Kingdom	1.4%	-4.8%	5.3%	1.4%	-6.5%	4.0%
United States	2.3%	-4.2%	5.5%	2.3%	-5.0%	4.5%

Source: Roskill

Notes: (1) Weighted based on purchasing power parity (PPP)

Table 3: Key macroeconomic indicators¹

	2018	2019	2020YTD	2019-12	2020-01	2020-02	2020-03	2020-04	2020-05
Industrial Production (% y-o-y)									
OECD	2.3	-1.3	-4.1	-3.1	-1.7	-1.6	-8.9		
United States	3.9	0.9	-5.3	-0.8	-0.9	-0.3	-4.9	-15.0	
Canada	3.9	-0.5	-1.4	-0.9	-0.2	0.8	-4.9		
Eurozone	0.7	-1.3	-5.6	-3.0	-2.1	-1.9	-12.8		
France	0.4	0.4	-7.3	-2.9	-3.0	-1.7	-17.3		
Germany	1.0	-4.3	-12.6	-6.0	-3.6	-2.8	-13.8	-30.1	
Italy	0.6	-1.1	-10.7	-3.4	-0.6	-2.3	-29.3		
United Kingdom	0.8	-1.5	-4.9	-2.2	-3.1	-3.4	-8.2		
Japan	1.0	-2.7	-7.0	-6.5	-2.4	-3.7	-6.8	-15.2	
Brazil	0.8	-1.1	-8.3	-2.2	0.0	0.1	-7.9	-25.5	
China	6.2	5.7	-1.0	6.9	6.9	-13.5	-1.1	3.9	
India	5.2	0.7	-3.3	0.4	2.1	4.6	-16.7		
Russia	3.5	2.3	-0.7	1.8	0.9	3.1	0.1	-6.8	
Composite Leading Indicators									
OECD	100.4	99.5	98.2	99.5	99.5	99.4	98.0	95.8	
United States	100.6	99.3	98.5	99.3	99.3	99.3	97.8	97.4	
Canada	100.3	99.1	98.5	99.2	99.4	99.6	98.0	96.9	
Eurozone	100.7	99.6	97.6	99.4	99.3	99.3	97.2	94.4	
France	100.3	99.5	97.4	99.5	99.4	99.3	96.8	94.1	
Germany	101.0	99.3	97.3	99.2	99.3	99.4	96.8	93.7	
Italy	100.8	99.5	98.0	99.4	99.4	99.4	97.8	95.6	
United Kingdom	99.9	99.2	97.3	99.7	99.9	100.1	98.2	91.1	
Japan	100.4	99.8	98.9	99.3	99.2	99.1	98.8	98.4	
Brazil	101.8	102.1	99.6	102.5	102.2	101.8	100.4	93.9	
China	99.4	98.6	92.4	97.8	97.7	84.9	93.5	93.7	
India	100.6	100.2	98.3	100.0	100.0	100.0	97.4	95.9	
Russia	101.2	100.5	97.0	100.1	99.6	98.9	98.3	91.3	
Manufacturing PMI									
United States ISM Index	58.9	51.2	46.9	47.8	50.9	50.1	49.1	41.5	43.1
EU Manufacturing Expectations	17.1	5.3	-13.6	2.6	5.2	5.4	-8.7	-48.0	-21.8
Japan Tankan Index	27.0	3.0	-21.0	-6.0	-6.0	-5.0	-20.0	-30.0	-44.0
China Caixin Manufacturing Index	50.7	50.5	48.3	51.5	51.1	40.3	50.1	49.4	50.7
Auto Sales (% y-o-y)									
US Passenger Car Registrations	0.0	-1.0	-21.5	-3.5	2.4	2.9	-32.5	-47.5	-32.9
Europe Vehicle Sales	-0.4	0.0	-18.8	15.8	-5.7	-4.7	-46.0		
Japan New Vehicle Registrations	0.1	-2.1	-21.6	-11.1	-12.1	-9.8	-8.9	-30.4	-46.7
China Passenger Car Sales	-4.3	-9.5	-38.3	-0.9	-20.5	-81.7	-48.4	-2.5	
China EV Passenger Vehicle Sales, 000s	66.0	69.2	29.0	105.0	29.3	9.3	34.5	43.1	
Construction Activity (% y-o-y) ⁽²⁾									
US New House Starts	3.4	3.8	19.2	12.6	16.9	21.9	22.7	15.4	
Germany New Construction Orders	6.0	4.9	4.5	2.7	3.2	5.2	5.2		
Japan, House Starts	-2.3	-4.0	-9.4	-7.4	-8.3	-9.1	-9.6	-10.6	
China, Floor Space Under Construction	3.2	8.6	2.5	7.9	6.3	3.4	3.0	2.5	

Table continues...

....Table continued	2018	2019	2020YTD	2019-12	2020-01	2020-02	2020-03	2020-04	2020-05
Crude Steel Production (% y-o-y)									
World	4.7	3.0	-4.2	3.7	-0.4	3.5	-5.9	-13.0	
China	6.4	7.6	1.1	11.6	1.4	5.0	-1.7	0.2	
EU	-0.5	-4.5	-15.4	-11.6	-11.5	-5.4	-19.8	-23.7	
US	6.1	1.3	-9.6	-2.5	1.8	1.6	-9.0	-32.5	
Japan, South Korean and Taiwan	1.0	-3.7	-7.6	-7.8	-3.6	2.8	-11.1	-17.2	
Rest of World	5.0	-0.8	-8.9	-1.1	1.3	4.7	-6.3	-35.0	
Additional Chinese Indicators (% y-o-y)									
Retail Sales, Current Prices	6.8	6.0	-17.0	6.0		-23.7	-18.1	-9.1	
Electricity Production	6.3	3.1	-2.2	3.5			-4.6	0.3	
Exports	9.9	0.5	-8.2	7.9	-17.2	-17.2	-6.6	3.5	-3.3
Imports	15.8	-2.7	-7.9	16.5	-4.0	-4.0	-0.9	-14.2	-16.7
Exchange Rates									
Euro (EUR/USD)	1.18	1.12	1.10	1.11	1.11	1.09	1.10	1.09	1.09
Pound Sterling (GBP/USD)	1.34	1.28	1.26	1.31	1.31	1.30	1.24	1.24	1.23
Chinese Renminbi (USD/RMB)	6.61	6.90	7.02	7.01	6.91	6.99	7.01	7.07	7.09
USD Trade Weighted Index	112.0	115.7	120.0	115.9	115.3	116.7	121.3	123.6	123.1
Equities									
S&P500	2,744	2,912	2,985	3,177	3,278	3,280	2,666	2,763	2,921
Shanghai Stock Exchange A Share	3,087	3,053	3,043	3,100	3,197	3,070	2,990	2,947	3,004
MSCI Global Index	2,100	2,151	2,135	2,321	2,382	2,367	1,907	1,952	2,058
FTSE World Mining Index	631	680	669	723	744	713	563	623	689
Other									
Oil Price, WTI (\$/BBL)	64.8	57.0	37.3	59.9	57.7	50.7	30.7	18.4	28.8
Gas Price, Henry Hub (\$/MMBTU)	3.07	2.53	1.84	2.28	2.04	1.84	1.73	1.76	1.81
Shipping, Baltic Dry Index	1,349	1,344	592	1,324	718	462	598	661	491

Source: Roskill; Thomson Reuters

Notes: (1) Period averages. YTD and MTD as of 8/06/2020

(2) 6 month moving average